

REMARKS

Claims 13, 22, 24, 25, 28, 37, 39, and 40 have been amended. Claims 1-4 have been cancelled. Claims 5-40 are currently pending in the application.

The Examiner objected to claim 13 for certain informalities. Claim 13 has been amended to correct for such informalities. Withdrawal of this objection is respectfully requested.

The Examiner rejected claims 22-25 and 37-40 under 35 USC § 102(b) as being anticipated by Fossum et al. (USPN 5,949,483; hereinafter "Fossum"). The Examiner rejected claims 5, 6, 8, and 9 under 35 USC § 103(a) as being unpatentable over Nam (USPN 7,408,443) in view of Tu et al. (USPN 2004/0041931; hereinafter "Tu"). The Examiner rejected claims 7 and 10 under 35 USC § 103(a) as being unpatentable over Nam, Tu, and Fossum. The Examiner rejected claims 11-18, 20, and 26-33 under 35 USC § 103(a) as being unpatentable over Berger et al. (USPN 4,453,177; hereinafter "Berger") in view of Guidash (USPN 6,710,804). And finally, the Examiner rejected claims 19, 21, 34, and 36 under 35 USC § 103(a) as being unpatentable over Berger, Guidash, and Fossum. Applicant requests reconsideration of the application.

102(b) Rejection

Independent claims 22 and 37 recite "a plurality of charge to voltage conversion regions; wherein the plurality of light receiving elements are arranged into groups with each group including two or more light receiving elements that share and are connected to a respective common charge to voltage conversion region" and "one or more transfer gate signal lines connected to the transfer mechanisms in each group to permit photo-generated charge of two or more light receiving elements in each group to be combined in the shared charge to voltage conversion region." Fossum discloses a charge-to-voltage conversion region in floating diffusion 40, an element included within each pixel cell 10 (see col. 6, lines 1-4). After the integration period, photo-generated charge is transferred from the photogate 12 to the floating diffusion 40, where the potential of the floating diffusion 40 is sensed by the source follower amplifier transistor

55. The signal read from the source follower amplifier transistor 55 is a voltage signal representative of the amount of charge generated by the photogate 12 (col. 6, lines 32-49). Because each pixel cell 10 includes a floating diffusion 40 that is connected to a source follower amplifier transistor 55, the signals read out of the pixels in a CMOS APS sensor by the readout circuitry are voltage signals. Consequently, regions 702 and 704, which are two capacitor banks that are interconnected through a set of programmable switches to perform signal averaging (col. 12, lines 21-24), allow the voltage signals read from blocks of pixels in the image sensor (e.g., 3 rows of pixels form one block) to be averaged together to reduce the resolution of an image (see col. 10, lines 12-41; col. 12, line 36 to col. 13, line 11).

In order for a reference to anticipate an invention, each and every element of the claimed invention must be found in a single reference. "The identical invention must be shown in as complete detail as is contained in the ... claim." MPEP § 2131. Applicant respectfully submits Fossum does not teach one or more transfer gate signal lines connected to the transfer mechanisms in each group to permit photo-generated charge of two or more light receiving elements in each group to be combined in a shared charge to voltage conversion region. And nothing found in Fossum teaches two or more light receiving elements sharing and connected to a single common charge to voltage conversion region. Therefore, for at least the following reason, Fossum does not anticipate independent claims 22 and 37.

"Claims in dependent form shall be construed to include all the limitations of the claim incorporated by reference into the dependent claim." 37 CFR § 1.75. Claims 23-25 depend from and include all of the limitations of independent claim 22, while claims 38-40 depend from and include all of the limitations of independent claim 37. For at least the reasons discussed above, Fossum does not anticipate independent claims 22 and 37. Accordingly, dependent claims 23-25 and 38-40 are also not anticipated by Fossum.

103(a) Rejections

Nam and Tu

Independent claims 5 and 8 recite "a color difference readout signal is output when a reset signal for at least one column circuit is obtained by sampling

the signal of one color and the light signal level for that column circuit is obtained by sampling the signal of a different color.” The Examiner notes Nam does not teach this limitation, but argues Tu discloses this aspect of the claimed invention in paragraphs [0049] - [0051]. In particular, the Examiner argues the reset from one pixel Vrst1 and the image signal from another pixel Vsig2 are used to output a difference signal (page 6 of final office action).

Applicant respectfully submits Tu does not teach or suggest obtaining a color difference readout signal as claimed in Applicant’s claims 5 and 8. Paragraphs [0049] - [0051] are describing how to use the shared column amplifier 434 for the embodiment shown in figure 9. The figure 9 embodiment includes two initial storage area capacitors 918, 920 that are capable of receiving and storing two simultaneously received signals from the column lines 902, 904, the shared amplifier 434, and two secondary storage area capacitors 460, 462 that store the amplified sample and reset signals (paragraph [0042]). Tu expressly states in this paragraph that since “Vrst of the first pixel and Vrst of the second desired pixel *are substantially equivalent*, Vrst of the first desired pixel coupled to column line 902 can be used for the Vrst of the second desired pixel coupled to column line 904 and visa versa” (emphasis added).

Thus, paragraphs [0049] - [0051] are describing how to obtain a pixel output from a single pixel using a shared amplifier. The reset value is sampled and stored in an initial storage capacitor, amplified, and then stored in a secondary capacitor. The signal value is sampled and stored in another initial capacitor, amplified, and then stored in another secondary capacitor. Both of these signals are then transferred from the secondary capacitors to the output stage 354.

Based on the foregoing, Applicant submits Nam and Tu do not teach or suggest outputting a color difference readout signal “when a reset signal for at least one column circuit is obtained by sampling the signal of one color and the light signal level for that column circuit is obtained by sampling the signal of a different color.” Therefore, for at least the following reason, Applicant’s independent claims 5 and 8 are not obvious in view of the combination of Nam and Tu.

“If an independent claim is not rendered obvious by prior art, then any claim depending from the independent claim is not obvious.” In re Fine, 5 USPQ2d 1596 (Fed. Cir. 1988) (see also M.P.E.P. § 2143.03). Claim 6 depends

from claim 5 while claim 9 depends from claim 8. Since the combination of Nam and Tu does not render independent claims 5 and 8 obvious, dependent claims 6 and 9 are also not obvious in view of Nam and Tu.

Nam, Tu, and Fossum

Applicant's arguments with respect to Nam and Tu apply to this rejection as well. And Fossum does not make up for the deficiencies of Nam and Tu. Therefore, Applicant submits independent claims 5 and 8 are not obvious in view of the combination of Nam, Tu, and Fossum. Claims 7 and 10 dependent from independent claims 5 and 8, respectively. "If an independent claim is not rendered obvious by prior art, then any claim depending from the independent claim is not obvious." In re Fine, 5 USPQ2d 1596 (Fed. Cir. 1988) (see also M.P.E.P. § 2143.03). Since the combination of Nam, Tu, and Fossum does not render independent claims 5 and 8 obvious, dependent claims 7 and 10 are also not obvious in view of Nam, Tu, and Fossum.

Berger and Guidash

Independent claims 11 and 26 recite "at least two signal storage banks comprised of individual signal storage elements; each of the at least two storage banks having enough individual storage elements to store the signals from at least one row of light receiving elements in the array, wherein multiple samples of each signal from at least one row of light receiving elements are concurrently stored in different individual signal storage elements." The Examiner notes Berger does not teach this limitation, but argues Guidash discloses this aspect of the claimed invention by teaching "that concurrently storing multiple samples of each signal from at least one row of light receiving elements in different individual signal storage elements within a single storage bank is preferred in order to cancel pixel offset noise and extend the dynamic range of the pixel" (page 11 of final office action).

In one embodiment, Guidash teaches a differential readout that stores a floating diffusion signal of a pixel 10 on one capacitor C4, a floating diffusion reset signal of the pixel 10 on another capacitor C5, and a photodetector signal level of the pixel 10 on a third capacitor C6 (col. 4, lines 40-65 and figure 1b). Another embodiment shown in figure 5 "envision[s] that a differential readout

be employed to read the floating diffusion 28 signal level of color filter 1 on capacitor C4 using the reset level on capacitor C5 as a reference input into the differential amplifier 31. A second differential readout for the photodetector 22 signal level of color filter 2 on capacitor C6 via differential amplifier 32 with the reset level of capacitor C5 again as the reference input.” (col. 6, lines 34-43).

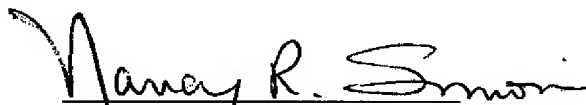
Nothing found in Guidash and Berger teaches or suggests “multiple samples of each signal from at least one row of light receiving elements are concurrently stored in different individual signal storage elements.” Therefore, independent claims 11 and 26 are not obvious in view of the combination. And since claims 12-18 and 20 depend from independent claim 11 while claims 27-33 and 35 from independent claim 26, dependent claims 12-18, 20, 27-33, and 35 are also not obvious in view of Berger and Guidash.

Berger, Guidash, and Fossum

Applicant’s arguments with respect to Berger and Guidash apply to this rejection as well. And Fossum does not make up for the deficiencies of Berger and Guidash. Therefore, Applicant submits independent claims 11 and 26 are not obvious in view of the combination of Berger, Guidash, and Fossum. Accordingly, dependent claims 19, 21, 34 and 36 are also not obvious in view of Berger, Guidash, and Fossum.

In view of the foregoing it is respectfully submitted that the claims in their present form are in condition for allowance and such action is respectfully requested.

Respectfully submitted,


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If the Examiner is unable to reach the Applicant(s) Attorney at the telephone number provided, the Examiner is requested to communicate with Eastman Kodak Company Patent Operations at (585) 477-4656.